# INNOVATION PERFORMANCE OF CZECH AND FINNISH MANUFACTURING ENTERPRISES AND THEIR POSITION IN THE EU

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## Abstract

The aim of this article is to assess the innovation performance of innovative small, medium-sized, and large enterprises operating in the manufacturing industry in two European countries – the Czech Republic (CR) and Finland, and to determine their position within the EU based on a comparison with average values of created Fictitious EU Country (FEUC). The FEUC includes the indicators and population of the EU member countries whose data were available. The performed analysis is based on the use of selected key performance indicators (related mainly to inputs that are expected to contribute to innovations) evaluating the enterprises´ innovation performance. The conducted research tries to identify the most significant drivers of innovation performance with regard to the size group of enterprises. Moreover, the achieved results are further compared within the innovation environment of the CR and Finland as well as the EU as a whole. It is worth highlighting the innovation resources of Finnish mainly small but partly also medium-sized enterprises, which in some monitored indicators occupy a much more significant share than in the case of the CR. This fact can indicate a particular signal, which size group of enterprises should become a target group of public support aiming to boost innovation performance.

## Keywords

Innovation; Innovation performance; Manufacturing industry; Czech Republic; Finland; EU.

## Introduction

Innovation is one of the busiest words today. In the macroeconomic climate, e.g., Feldman [1] considers innovations essential for economic growth and development. Innovation's role as a key driver of economic growth has been confirmed by multiple studies following early seminal works of economists such as Schumpeter [2] and, more recently, Arrow [3] or Aghion and Howitt [4].

Moreover, at microeconomic level, many enterprises are placing increasing emphasis on their innovation activities which are then reflected in their innovation performance. That is why the authors decided to focus on the assessment of the innovation performance. This issue will be analyzed on three size groups of manufacturing enterprises using selected key performance indicators (KPIs) that will be further compared in an international context.

Previous research by Blaschke and Demel [5] dealing with the degree of enterprises' involvement in innovation activities within the Liberec Region did not confirm that the ownership (domestic nor foreign) plays a crucial role in terms of innovation performance. Also, it cannot be clearly stated that important innovation impulses and movements occur mainly in large foreign-owned enterprises that are presented in the region. This ambiguous result initiated new research dealing with innovation performance in enterprises of various sizes (small, medium-sized, and large). The key concepts in this research will be the innovative activity of the enterprise, innovation performance, and the size of the enterprise (with respect to the number of employees). The comparison will be made between the CR, Finland, and the EU benchmark. This article is based on and further develops a conference paper of the authors [6].

According to Guan and Zuo [7] a large amount of literature, both theoretical and empirical, confirms the important role that technological change plays in achieving sustainable economic growth. In recent years, the world, especially Western authors, have argued that the real drivers of major innovation movements are not large but medium-sized or even small enterprises, even though they have more limited (not only) financial resources. Klewitz and Hansen [8] summarize the research of others into the assertion that innovative outputs can be identified in small and medium-sized enterprises (SMEs), especially at the level of product, process, and organizational innovations, and that these enterprises are the main contributors to sustainable development of national economies. In smaller countries, they have even become the economic backbone, as exemplified by the innovation results of SMEs in Finland [9].

According to Monhen et al. [10] industrial countries have reached a stage of economic development that many describe as 'the knowledge-based economy'. Also, as Tödtling and Kaufmann [11] noted more than twenty years ago, innovation is taking place interactively between firms and knowledge providers and is increasingly supported by policy institutions, technology transfer agencies, and education. It is apparent that the universities of the twenty-first century, which are the engines of the knowledge-based economy, have a unique opportunity to gain substantial funding from the industry that is suffering from the insufficient number of experts and research in the industry to support innovation performance [12].

The OECD [13] considers as innovation activities all development, financial, and business activities carried out by an enterprise that aims to lead to the creation of innovations. According to Walcher and Wöhrl [14] or Birchall et al. [15], innovation is one of the most important strategic tools to help an enterprise gain a significant competitive advantage in a volatile and competitive economic environment.

Sawang [16] points out enterprises often assume that investing in innovation will automatically lead to increased productivity, but investment alone does not guarantee its successful implementation. However, the successful implementation of innovations is associated with realistic goal setting, proper planning of individual activities, constant monitoring, and measurement of results [17]. The sum of these enterprise activities enables timely response to problems and corrective measures [18].

In order to correctly manage innovations, it is essential to monitor innovation performance adequately. Birchall et al. [15] define innovation performance as the development of the overall innovative capabilities of the enterprise. According to Ahmad et al. [19], innovation performance includes using new ideas or creativity to lead to innovative performance, which leads to the improvement of existing products (services) or to increased efficiency of current procedures and processes.

Almeida and Sequeira [20] view innovation performance as the successes and results of established innovations. In the same spirit, Dima [21] also perceives innovation performance

as outputs – i.e., outcomes and benefits that the enterprise derives from a successful innovation process. A more comprehensive view of innovation performance is offered, for example, by Thomas and Murphy [22], who describe it as the enterprise's ability to transform innovative inputs into marketable and successful outputs.

Bloch [23] considers the share of innovative enterprises, i.e., enterprises that have introduced product or process innovations, on the total number of enterprises in a given economy to be a very widely used simple KPI related to monitoring or measuring innovation performance. However, according to Arundel [24], this KPI provides an incomplete picture of the innovative performance of an enterprise, a specific sector or the country as a whole, and can be misleading in international comparisons. That is why more detailed indicators need to be examined at the microeconomic level in terms of the research goal. However, Amaratunga et al. [25] argues that there is no such indicator that would be able to capture innovation performance comprehensively. Therefore, it is necessary to use more indicators (relevant inputs and outputs). A well-arranged overview of 82 indicators and factors evaluating innovations can be found, e.g., in Dziallas and Blind [26].

# 1 Methodology

Within this research, the innovation performance of enterprises operating in the manufacturing industry was assessed and compared not only among individual size groups of the enterprises (small, medium-sized, and large ones) but also within the international environment between two European countries – the CR and Finland. Moreover, the values of the indicators related to the innovation performance of the analyzed countries were compared with the average values of EU member countries to determine their position in the field of innovations within the EU.

The manufacturing industry covers a wide range of activities listed in section „C" of the European Industry-standard classification system NACE (Nomenclature of Economic Activities) designed by the EU. It contains the physical or chemical transformation of (raw) materials (i.e., products of agriculture, forestry, fishing, mining, or quarrying and products of other manufacturing activities), substances, or components [27].

The authors decided to analyze and compare the innovation performance of the Czech enterprises with Finland and the EU because Finland is today ranked among the most innovative economies in the world and claims the leadership in creativeness, innovations and sustainability [28], [29], [30]. On the other hand, the CR is a small open landlocked economy in the middle of Europe appreciably dependent on the manufacturing industry.

## 1.1 Set of Enterprises

The enterprises of the manufacturing industry in the CR and Finland were divided into three categories according to the number of employees: small (10–49), medium-sized (50–249), and large (250 and more employees) ones. These categories reflect the definition of small and medium-sized enterprises based on the European Commission [31].

Internationality was not considered in this research, i.e., each category includes both domestic and foreign-controlled enterprises. Based on the presented views, the innovation performance was explored from two perspectives – inputs (resources) that are expected to contribute to innovations and outputs of innovation activities. Therefore, four key performance indicators (KPIs) related to finance were set. They are listed in Tab. 1 – three of them related to inputs (KPI 1–3) and one representing innovation outputs (KPI 4). Using these indicators, the innovation performance of enterprises was evaluated.

***Tab. 1:*** *Overview of monitored key performance indicators*

| No. | In/Output | Description |
|---|---|---|
| **KPI 1** | Input | Expenditure on innovation (including R&D) |
| **KPI 2** | Input | Expenditure on R&D performed in-house |
| **KPI 3** | Input | Expenditure on R&D contracted out |
| **KPI 4** | Output | Turnover from new or significantly improved products |

*Source: Own*

The research was focused on innovative and product innovative enterprises. According to Eurostat [13], an enterprise with successfully implemented product or process innovation in the observed period is considered innovative. Product innovative enterprises, then, are only the ones with product innovation (regardless of any other type of innovation).

### 1.2 Source of Data

The research used publicly available aggregated data from the internal database of Eurostat [32] that collects the data on science, technology, and innovation within the Community Innovation Survey. These data are primarily collected by individual national statistical offices and have also been verified with these sources. The data outputs will be presented in more detail in the next chapter of this article.

### 1.3 Comparison

The manufacturing industry environment and innovations stemming from this sector of economy as well as values of aforementioned KPIs were firstly compared between the CR and Finland. Besides the KPIs, also number of innovative enterprises in the manufacturing industry was compared.

Moreover, the values of the CR and Finland were then further compared with the benchmark of the EU. When analyzing the number of manufacturing innovative and product innovative enterprises, the benchmark was set as the average value of the EU member countries, see formula 1. This EU benchmark was obtained as the sum of values of individual indicators reported for every single member country of the EU (reported by Eurostat) divided by the total number of EU countries.

$$EU\ (27) = \frac{Number\ of\ enterprises\ in\ EU\ member\ countries}{Number\ of\ EU\ member\ countries} \tag{1}$$

Since the KPIs are affected by the number of enterprises which is dependent, among other factors, on the size of the economy – it is possible to expect that the bigger the economy (country) is, the more enterprises can be found there, the authors decided to take into consideration the population of each country. Therefore, the Finnish values of KPIs were transformed to eliminate the different population of each country. In other words, the values of Finland were recalculated to the population of the CR, see formula 2. By performing this operation, it was found out what values would Finland achieved if it had the same population as the CR maintaining the same density of the indicator.

$$KPI_{FIN-adjusted} = KPI_{FIN}\frac{Population_{CZE}}{Population_{FIN}} \tag{2}$$

The same approach was applied to the comparison with the EU average where the population of the EU includes population of all member countries for which the data related to the

analyzed KPIs were available, see formula 3. Therefore, a Fictitious European Union Country (FEUC), which includes the population of most EU member countries, was set. Countries whose population was not taken into account are mentioned in research limitations.

$$KPI_{FEUC} = KPI_{FEUC} \frac{Population_{CZE}}{Population_{FEUC}} \quad (3)$$

### 1.4 Research Limitations

Due to the unavailability of data at a lower level, all KPIs were monitored on the set of all enterprises operating in the manufacturing industry (i.e., both innovative and non-innovative enterprises are included). However, the authors believe that innovative enterprises make up the majority share by the logic of the matter. For non-innovative enterprises (i.e., enterprises that did not implement any innovation), it can be assumed that they invest in innovations or R&D only in sporadic cases. The same is true in outputs – non-innovative enterprises logically cannot have revenues from innovated (i.e., new or significantly improved) products.

Tab. 2 presents countries that were excluded from the research due to the lack of data – data on the analysed KPIs were not available for the mentioned size group of enterprises, so these countries were left out from constructing the EU benchmark as well as their population were not taken into account.

***Tab. 2:*** *Countries excluded from constructing the EU benchmark*

| **KPI 1** | | | **KPI 2** | | |
|---|---|---|---|---|---|
| **Small** | **Medium** | **Large** | **Small** | **Medium** | **Large** |
| Luxembourg | Luxembourg | Netherlands | Bulgaria | Bulgaria | Bulgaria |
| Netherlands | Netherlands | | Luxembourg | Luxembourg | Luxembourg |
| | | | Netherlands | Netherlands | Netherlands |
| | | | | Slovenia | Slovenia |
| **KPI 3** | | | **KPI 4** | | |
| **Small** | **Medium** | **Large** | **Small** | **Medium** | **Large** |
| Bulgaria | Bulgaria | Bulgaria | Luxembourg | Bulgaria | Bulgaria |
| Luxembourg | Luxembourg | Netherlands | Netherlands | Luxembourg | Netherlands |
| Netherlands | Netherlands | Slovenia | | Netherlands | |
| Romania | Romania | | | | |
| | Slovenia | | | | |

*Source: Own*

Although all data used in this research come from 2018 when the United Kingdom (UK) was a member country of the EU, it was not taken into account in the calculations as well – the EU values were obtained regardless of the UK. If all the data were available, the benchmark would have included 27 countries.

## 2 Results of Research

In this part of the article, the results of the empirical research are presented and commented in more detail. This chapter was divided into two sections – first part includes the comparison between the CR and Finland, following by the second part in which the comparison with the EU was made.

## 2.1 Czech Republic vs. Finland

In this part, basic situational overview of the manufacturing industry environment was analyzed – number of enterprises in the Czech Republic (CZE) and Finland (FIN) was compared. The data in Tab. 3 are presented at three levels – total number of enterprises, innovative enterprises, and product innovative enterprises.

***Tab. 3:*** *Overview of manufacturing industry*

| Size | Total number of enterprises | | | | Innovative enterprises | | | | Product innovative enterprises | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CZE | % | FIN | % | CZE | % | FIN | % | CZE | % | FIN | % |
| S | 8,252 | 68 | 2,353 | 70 | 3,611 | 58 | 1,399 | 63 | 1,984 | 53 | 775 | 56 |
| M | 3,054 | 25 | 816 | 24 | 1,909 | 31 | 657 | 29 | 1,197 | 32 | 454 | 33 |
| L | 888 | 7 | 192 | 6 | 691 | 11 | 179 | 8 | 536 | 14 | 160 | 12 |
| ∑ | 12,194 | 100 | 3,361 | 100 | 6,211 | 100 | 2,235 | 100 | 3,717 | 100 | 1,389 | 100 |

*Source: Own based on [32]*

Looking at the number of innovative enterprises operating in the manufacturing industry, the data show that compared to Finland, the CR has a certain quantitative advantage – there are almost three times more innovative enterprises – the most striking difference between the two countries is the representation of large enterprises – the CR having almost four times more than Finland.

Finland (with half the population of the CR) has fewer enterprises in the manufacturing industry (3.6 times). However, both countries have similar parameters for their division into large, medium-sized, and small ones. There are 4.6 times more large Czech enterprises, 3.7 times more medium-sized enterprises, and 3.3 times more small ones than in the case of Finland. Therefore, it can be stated that the manufacturing industry is more important for the CR and its economy than for Finland. If we switch to innovative enterprises, it is 2.7 times more for all these size groups of enterprises (3.8 times more large enterprises; 2.9 times more medium-sized enterprises, and only 2.6 more small ones). And finally, for product innovative enterprises, there are 2.7 times more (all sized groups), 3.4 times (large), 2.6 times more (medium-sized and small) in the CR than in Finland. Overall, it can be said that a significant part of especially large Czech enterprises, which are often foreign-owned, can be considered innovative or even product innovative.

Tab. 4 presents the monitored KPIs. Based on the performed literature research, the monitored KPIs consist of three indicators related to sources of innovation performance (inputs) and one which includes outputs of innovation activities. KPI 1 – expenditure on innovation – includes, in addition to R&D expenditures both performed in-house and contracted out, also other spending related to the successful implementation of innovation – e.g., acquisition of buildings, machinery, equipment, software, fees related to intellectual property rights, labour costs of internal and external employees involved in the innovation process, etc. KPI 2 and KPI 3 then focus exclusively on the area of R&D financing which is monitored internally within the enterprise (KPI 2), but also externally in cooperation with other partners such as suppliers, universities, commercial labs, government, public or private research institutes and others (KPI 3). KPI 4 deals with sales, either from new or improved products. This indicates the turnover of product innovative enterprises.

***Tab. 4:*** *Key performance indicators in mil. EUR (2018)*

| Size | KPI 1 | | | | KPI 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Input | | | | Input | | | |
| | Expenditure on innovation (including R&D) | | | | Expenditure on R&D performed in-house | | | |
| | CZE | % | FIN | % | CZE | % | FIN | % |
| S | 342.1 | 8 | 332.5 | 9 | 68.7 | 8 | 183.9 | 7 |
| M | 1,008.4 | 24 | 696.8 | 19 | 185.9 | 21 | 398.9 | 14 |
| L | 2,839.1 | 68 | 2,677.0 | 72 | 627.9 | 71 | 2,169.8 | 79 |
| ∑ | 4,189.5 | 100 | 3,706.3 | 100 | 882.4 | 100 | 2,752.6 | 100 |
| **Size** | **KPI 3** | | | | **KPI 4** | | | |
| | Input | | | | Output | | | |
| | Expenditure on R&D contracted out | | | | Turnover from new or improved products | | | |
| | CZE | % | FIN | % | CZE | % | FIN | % |
| S | 15.1 | 3 | 48.8 | 14 | 1,289.1 | 4 | 1,659.6 | 8 |
| M | 76.4 | 16 | 147.4 | 42 | 4,007.6 | 12 | 3,248.5 | 16 |
| L | 391.5 | 81 | 158.1 | 45 | 27,037 | 84 | 15,193 | 76 |
| ∑ | 483.0 | 100 | 354.3 | 100 | 33,333 | 100 | 20,102 | 100 |

*Source: Own based on [32]*

At the first sight, a significant difference can be seen in the financial resources that enterprises invest in innovation activities. In absolute terms, the amounts are quite balanced. However, considering the number of enterprises (see Tab. 3), it is clear that Finnish enterprises have significantly more resources which are invested into R&D. Interestingly, large Finnish enterprises make extensive use of their own resources.

For KPI 1, the CR reports only 1.1 times higher expenditures of all enterprises on innovation including R&D. Compared to Finland, large and small Czech enterprises show essentially the same level of expenditures, medium-sized Czech enterprises 1.4 times higher than the Finnish ones. If we again consider the different number of enterprises (see Tab. 3), the Finnish invested resources are up to three times higher.

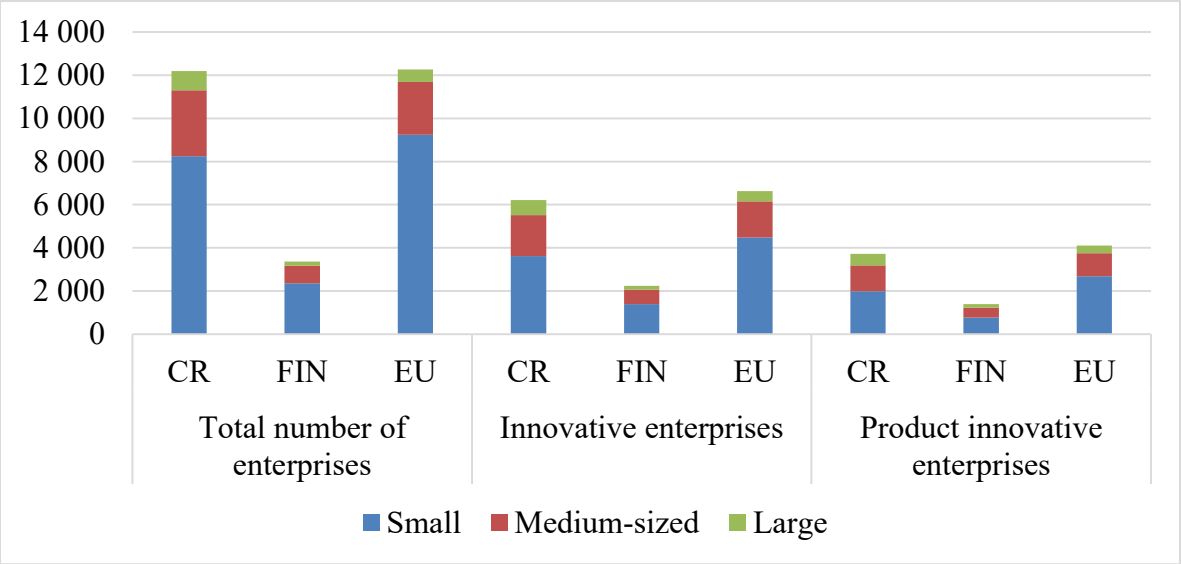
From their own resources (KPI 2), all Finnish enterprises invest three times more in R&D than the Czech ones. For large enterprises, it is almost 3.5 times; for medium-sized enterprises, it is more than twice; for small enterprises, it is 2.7 times more. The contribution of large Finnish enterprises to innovation "from their own resources" is very significant here.

From external sources (KPI 3), all monitored Finnish enterprises invest 1.2 times less than the Czech ones, 2.5 times less for large enterprises, 1.9 more for medium-sized enterprises, and 3.2 times more for the small ones. It is obvious that in Finland, external support is mainly targeted at small enterprises.

KPI 4: The CR has 1.6 times higher turnover from innovated products than Finland. For large enterprises, it is 1.8 times higher; for medium-sized enterprises, 1.2 times; for small enterprises, there is 1.3 times higher turnover in favour of Finnish enterprises. It means that especially small Finnish enterprises can monetize their innovative products significantly better than the Czech small enterprises.

## 2.2 Czech Republic and Finland in the EU

In this part, the results of the Czech and Finnish manufacturing enterprises are further compared with the EU benchmark. Fig. 1 provides a comparison of the number of individual size groups of enterprises in the CR and Finland. However, this comparison is complemented by the EU benchmark to demonstrate the position of both countries within the EU.




*Source: Own based on [32]*

***Fig. 1:*** *Number of enterprises in the manufacturing industry*

From Fig. 1, it is possible to conclude that the CR is much closer to the EU average regarding the absolute numbers – there are much fewer manufacturing enterprises in Finland. The CR is one of the most industrial countries in Europe – it is above the EU average in the case of both large and medium-sized enterprises. But the closer it goes to the innovative area, the smaller the difference between the CR and Finland is, especially in the groups of medium-sized enterprises. However, as far as the share of individual size groups is concerned, the situation is practically identical in all analyzed samples. It is necessary to emphasize the share of SMEs in the total number of manufacturing enterprises, which in the CR, Finland as well as the EU is around 90%. Carvalho and Yordanova [33] even state that SMEs represent the largest number of enterprises in the EU (99% of all registered enterprises) being the major source of economic growth [34], [35].

In Tab. 5 to Tab. 8 the Czech values of KPIs are compared with the Finnish ones as well with the EU benchmark. For comparison, and as a benchmark, a Fictitious European Union Country (FEUC) with an average population of the EU was created here, and adjusted KPI numbers were derived from EU-wide data. Moreover, the amount of EU member countries included in calculating the population of the FEUC (see the numbers in brackets) varies due to the lack of data on the analyzed KPIs in the given size group of enterprises.

***Tab. 5:*** *Comparison of KPI 1 – Expenditure on innovation (including R&D)*

| KPI 1 | Country | Invested (mil. EUR) | Population (mil.) | Adjusted (mil. EUR) | % |
|---|---|---|---|---|---|
| **Small** | **CZE** | 342 | 10.61 | 342 | 100 % |
| | **FIN** | 333 | 5.51 | 640 | 187 % |
| | **FEUC (25)** | 17,002 | 428.69 | 421 | 123 % |
| **Medium** | **CZE** | 1,008 | 10.61 | 1,008 | 100 % |
| | **FIN** | 697 | 5.51 | 1,341 | 133 % |
| | **FEUC (25)** | 26,753 | 428.69 | 662 | 66 % |
| **Large** | **CZE** | 2,839 | 10.61 | 2,839 | 100 % |
| | **FIN** | 2,677 | 5.51 | 5,152 | 181 % |
| | **FEUC (26)** | 199,232 | 429.29 | 4,924 | 173 % |

*Source: Own based on [32], [36]*

For KPI 1 the figures for Finland, the CR, and the EU are relatively similar, although even here it is in favor of Finland.

This means that the total Expenditure on innovation (including R&D) is the largest in Finland at all companies, regardless of their size. CR is very close to the European average at small companies and is above it at medium-sized companies, which is quite surprising.

***Tab. 6:*** *Comparison of KPI 2 – Expenditure on R&D performed in-house*

| KPI 2 | Country | Invested (mil. EUR) | Population (mil.) | Adjusted (mil. EUR) | % |
|---|---|---|---|---|---|
| **Small** | **CZE** | 69 | 10.61 | 69 | 100 % |
| | **FIN** | 184 | 5.51 | 354 | 515 % |
| | **FEUC (24)** | 6,095 | 421.64 | 153 | 223 % |
| **Medium** | **CZE** | 186 | 10.61 | 186 | 100 % |
| | **FIN** | 399 | 5.51 | 768 | 413 % |
| | **FEUC (23)** | 13,099 | 419.57 | 331 | 178 % |
| **Large** | **CZE** | 628 | 10.61 | 628 | 100 % |
| | **FIN** | 2,170 | 5.51 | 4,176 | 665 % |
| | **FEUC (23)** | 111,523 | 419.57 | 2,820 | 449 % |

*Source: Own based on [32], [36]*

For KPI 2 the difference between Finland, CR, and EU is much more significant. At medium-sized companies, the Expenditure on R&D performed in-house CR is close to the EU, at small companies it is less so, at large companies the differences are already abysmal. Finnish numbers are already several times higher. However, it should be borne in mind that the number of large companies in the Finnish manufacturing industry is relatively low.

***Tab. 7:*** *Comparison of KPI 3 – Expenditure on R&D contracted out*

| KPI 3 | Country | Invested (mil. EUR) | Population (mil.) | Adjusted (mil. EUR) | % |
|---|---|---|---|---|---|
| **Small** | **CZE** | 15 | 10.61 | 15 | 100 % |
| | **FIN** | 76 | 5.51 | 147 | 974 % |
| | **FEUC (23)** | 1,418 | 402.12 | 37 | 248 % |
| **Medium** | **CZE** | 76 | 10.61 | 76 | 100 % |
| | **FIN** | 147 | 5.51 | 284 | 371 % |
| | **FEUC (22)** | 2,655 | 400.05 | 70 | 92 % |
| **Large** | **CZE** | 392 | 10.61 | 392 | 100 % |
| | **FIN** | 158 | 5.51 | 304 | 78 % |
| | **FEUC (24)** | 29,856 | 421.64 | 751 | 192 % |

*Source: Own based on [32], [36]*

For KPI 3 the largest difference between Finland and the CR is recorded, namely at small companies. This shows that Finnish small businesses are succeeding in raising significant funds from outside. At medium-sized Finnish companies, this also applies to a lesser extent, Czech companies are again above the imaginary European average in this indicator. On the contrary, it turned out at large companies, where both Finland (the lowest) and the CR show below-average values of the selected indicator.

***Tab. 8:*** *Comparison of KPI 4 – Turnover from new or significantly improved products*

| KPI 4 | Country | Turnover (mil. EUR) | Population (mil.) | Adjusted (mil. EUR) | % |
|---|---|---|---|---|---|
| **Small** | **CZE** | 1,289 | 10.61 | 1,289 | 100 % |
| | **FIN** | 1,660 | 5.51 | 3,195 | 248 % |
| | **FEUC (25)** | 77,183 | 428.69 | 1,910 | 148 % |
| **Medium** | **CZE** | 4,008 | 10.61 | 4,008 | 100 % |
| | **FIN** | 3,249 | 5.51 | 6,253 | 156 % |
| | **FEUC (24)** | 159,735 | 421.64 | 4,020 | 100 % |
| **Large** | **CZE** | 27,037 | 10.61 | 27,037 | 100 % |
| | **FIN** | 15,193 | 5.51 | 29,239 | 108 % |
| | **FEUC (25)** | 964,123 | 422.24 | 24,226 | 90 % |

*Source: Own based on [32], [36]*

The Turnover from new or significantly improved products was chosen as the only one, but very crucial output KPI. Here, too, the value of the indicator is highest at small companies in Finland, and to a lesser extent at medium-sized companies. The values are very balanced at large companies, where both Finland and the CR are above the European average. The CR is below the European average at small companies for the selected indicator, the result is balanced at medium-sized companies.

**Conclusion**

The objective of this article was to assess the innovation performance of three size groups of innovative enterprises (small, medium-sized, large) operating in the manufacturing industry and compare it in an international environment among the Czech Republic and Finland, and then, due to the methodology described in the article, a derived European average.

Based on the performed analysis, it is impossible to unambiguously identify the size group of enterprises that is the essential carrier of innovation performance. However, considering the frequent claims about the limited resources of small and medium-sized enterprises, it is evident that their outputs, observed in this article, show in selected indicators at least comparable innovation performance of small, medium and large companies. This is especially obvious at Finnish small and medium-sized enterprises that show considerably higher innovation performance than Czech small enterprises.

Finnish small and medium-sized enterprises can draw external financial resources for their own innovation activities very well. The same model of public support use would probably be applicable in the Czech conditions as well – this may motivate further research of the authors. Still, it would mean a stronger involvement of other fundamental pillars of innovation activities, such as an adapted education system (especially higher education) and support of start-ups.

As far as the Czech Republic is concerned, it can be said that at small and medium-sized companies the values of indicators sometimes very significantly did not reach the Finnish values, while for large companies the opposite was the case. However, it should be taken into account here that there are only a few large companies in the Finnish manufacturing industry and most of the large companies in the Czech manufacturing industry are in foreign hands. In comparison with the European average, it can be said that the Czech Republic, for selected KPIs, oscillated around this average.

The identification and analysis of other indicators related to innovation activities and their development over time will be subject to further research of the authors. Moreover, the authors will focus more on the analysis of the relationship between selected innovation inputs and outputs trying to answer the research question if the higher amount of innovation inputs is reflected also in the amount of innovation outputs.

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## INOVAČNÍ VÝKONNOST ČESKÝCH A FINSKÝCH VÝROBNÍCH SPOLEČNOSTÍ A JEJICH POSTAVENÍ V RÁMCI EU

Cílem tohoto článku je zhodnotit inovační výkonnost malých, středních a velkých inovačních podniků působících ve zpracovatelském průmyslu ve dvou evropských zemích – České republice a Finsku – a určit jejich postavení v rámci EU na základě srovnání s průměrnými hodnotami vytvořené fiktivní země EU. Ta zahrnuje ukazatele a populaci členských zemí EU, jejichž data byla k dispozici. Provedená analýza je založena na využití vybraných klíčových ukazatelů výkonnosti (vztahujících se především ke vstupům, které mají přispět k inovacím) hodnotících inovační výkonnost podniků. Provedený výzkum se snaží identifikovat nejvýznamnější faktory inovační výkonnosti s ohledem na velikostní skupinu podniků. Dosažené výsledky jsou navíc dále porovnávány v rámci inovačního prostředí ČR a Finska i EU jako celku. Za pozornost stojí inovační zdroje finských, zejména malých, částečně i středních podniků, které v některých sledovaných ukazatelích zaujímají mnohem významnější podíl než v případě ČR. Tato skutečnost může být určitým signálem, která velikostní skupina podniků by se měla stát cílovou skupinou veřejné podpory zaměřené na zvýšení inovační výkonnosti.

## INNOVATIVE LEISTUNGSFÄHIGKEIT VON PRODUKTIONSUNTERNEHMEN UND DEREN STELLUNG IM RAHMEN DER EU

Das Ziel dieses Artikels besteht in der Bewertung kleiner, mittlerer und großer innovativer Bertriebe, welche in zwei Ländern, Tschechien und Finnland, in der verarbeitenden Industrie tätig sind, darin, und deren Position innerhalb der EU auf der Grundlage des Vergleichs mit den Durchschnittswerten eines künstlich erschaffenen EU-Landes zu bestimmen. Dieses umfasst die Indikatoren und die Population der Mitgliedsländer der EU, deren Daten zur Verfügung standen. Die durchgeführte Analyse beruhte auf der Nutzung ausgewählter Schlüsselindikatoren der Leistungsfähigkeit, welche sich vor allem auf die Eingaben der Daten beziehen, die zu den Innovationen beitragen sollen, und die Innovationsfähigkeit der Betriebe bewerten. Die durchgeführte Untersuchung ist bemüht, die bedeutendsten Faktoren der innovativen Leistungsfähigkeit unter Berücksichtigung auf die Größengruppen der Betriebe zu identifizieren. Die erzielten Ergebnisse werden darüber hinaus im Rahmen des innovativen Umfeldes der Tschechischen Republik und Finnlands sowie der EU als Ganzer verglichen. Aufmerksamkeit verdienen auch die Innovationsquellen finnischer, besonders kleiner, teilweise auch mittlerer Betriebe, welche in einigen betrachteten Indikatoren einen weitaus bedeutenderen Anteil einnehmen als im Falle der Tschechischen Republik. Diese Tatsache kann als ein bestimmtes Signal gewertet werden, welche Größengruppe der Betriebe zur Zielgruppe öffentlicher, auf die Steigerung innovativer Leistungsfähigkeit gerichteter Unterstützung werden sollte.

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Celem niniejszego artykułu jest ocena wydajności innowacyjnej małych, średnich i dużych przedsiębiorstw innowacyjnych działających w przemyśle przetwórczym w dwóch krajach europejskich – Republice Czeskiej i Finlandii – oraz określenie ich pozycji w ramach UE na bazie porównania z przeciętnymi wartościami fikcyjnie stworzonego państwa UE. Obejmuje ona wskaźniki oraz populację krajów członkowskich UE, których dane były dostępne. Przeprowadzona analiza bazuje na wykorzystaniu wybranych kluczowych wskaźników wydajności (odnoszących się przede wszystkim do elementów na wejściu, które mają przyczynić się do innowacji) oceniających innowacyjną wydajność przedsiębiorstw. W ramach przeprowadzonych badań podjęto próbę zidentyfikowania najważniejszych czynników wydajności innowacyjnej przy uwzględnieniu grupy wielkościowej przedsiębiorstw. Ponadto otrzymane wyniki porównano na tle otoczenia innowacyjnego Czech i Finlandii oraz całej UE. Warte uwagi są innowacyjne zasoby fińskich, w szczególności małych, częściowo też średnich przedsiębiorstw, które w niektórych badanych wskaźnikach mają o wiele większy udział niż w przypadku Czech. Fakt ten może być pewną wskazówką, która grupa wielkościowa przedsiębiorstw powinna zostać grupą docelową pomocy publicznej skierowanej na podniesienie wydajności innowacyjnej.